

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

Listing of Claims:

Claim 1 (Currently Amended): A data processing apparatus operable to identify at ~~least one of a plurality of code words, forming a code word set,~~ a code word present in a marked version of a material item, the material item composed of a plurality of units and the code word composed of a plurality of parts, each part including different data from the code word, the marked version ~~having been~~ formed by combining each of ~~a~~ the plurality of parts of ~~a~~ the code word with one of ~~a~~ the plurality of units ~~from which the material item is comprised,~~ the apparatus comprising

a recovery processor operable to recover a partial code word composed by at least one of the plurality of parts ~~part~~ of the code word from at least one of the plurality of corresponding ~~unit~~ units of the marked material item, and

a correlator operable to generate for the marked material ~~unit~~ item a dependent correlation value by correlating the partial ~~part of the~~ code word ~~recovered from the material unit~~ with a corresponding ~~part of at least one of a re-generated code word from the code word set~~ partial stored code word that is a part of a whole stored code word, and

a detector operable to determine whether ~~at least one of the code words~~ the whole stored code word is present in the marked material item ~~from~~ based on the dependent correlation value for the partial ~~part of the~~ code word exceeding a predetermined threshold, wherein

when the dependent correlation value does not exceed the predetermined threshold, the correlator is operable ~~under control of the detector~~ to iteratively increase a number of ~~code word parts~~ of the code word used, to increase information quantity of the recovered

~~partial code word to form the recovered part of the code word, each code word part taken from successive material units,~~

~~each time the number of code word parts used to form the recovered part of the information quantity of the partial code word is iteratively-increased, the correlator is operable to generate a dependent correlation value by correlating the recovered part of the partial code word having increased information quantity with a corresponding parts of the re-generated-partial stored code word, the iterative increasing of the recovered-part-information quantity of the partial code word continuing until the whole code word is recovered by the recovery processor, and correlated with the whole regenerated-stored code word by the correlator, or the predetermined threshold exceeded.~~

Claim 2 (Currently Amended): A data processing apparatus as claimed in Claim 1, wherein the detector is operable in combination with the correlator to form a dependent correlation ~~value-values~~ for a plurality of ~~parts of the recovered~~partial code word words in parallel, and if some of the correlation ~~value-values exceed~~exceeds the predetermined threshold ~~for one of the dependent correlation values~~, the detector is operable to identify the code word ~~as present~~ according to a predetermined false detection probability.

Claim 3 (Currently Amended): A data processing apparatus as claimed in Claim 2, wherein the detector is operable in combination with the correlator to form the dependent correlation values by combining the plurality of parts of the code word recovered from successive material units to form a partial code word, and by correlating the parts-partial code word formed from successive material units with corresponding part of the ~~regenerated partial stored~~ code word.

Claim 4 (Currently Amended): A data processing apparatus as claimed in Claim 3, wherein the correlator is operable to form the dependent correlation values by combining the plurality of parts of the code word recovered from a first plurality of successive units with plurality of parts of the code word recovered from second plurality of successive units to generate first and second partial code words, and correlating the first and second partial code word ~~combined parts~~ with corresponding parts of the ~~re-generated partial stored code word~~ words.

Claim 5 (Currently Amended): A data processing apparatus as claimed in Claim 1, wherein the correlator is operable under control of the detector

to combine the parts of the code word recovered from a first plurality of successive units, and to form the dependent correlation value for the combined parts forming a first partial code word, the detector being operable to detect the whole code word if the dependent correlation value exceeds the predetermined threshold and otherwise

to combine the parts of the code word recovered from a second plurality of successive units, the number of units corresponding to the first plurality, and to form the dependent correlation value for the combined parts forming a second partial code word, the detector being operable to detect the whole code word if the dependent correlation value exceeds the predetermined threshold and otherwise

to combine the parts of the code word recovered from the first plurality of successive units with parts of the code word recovered from the second plurality of successive units, and to form the dependent correlation value for the combined parts forming a third partial code word, the detector being operable to detect the whole code word if the dependent correlation value exceeds the predetermined threshold and otherwise

to combine the parts of the code word recovered from a third plurality of successive units, and to form the dependent correlation value for the combined parts forming a fourth partial code word, the detector being operable to detect the whole code word if the dependent correlation value exceeds the predetermined threshold and otherwise

to combine the parts of the code word recovered from a fourth plurality of successive units, the number of units corresponding to the third plurality, and to form the dependent correlation value for the combined parts forming a fifth partial code word, the detector being operable to detect the whole code word if the dependent correlation value exceeds the predetermined threshold and otherwise

to combine the parts of the code word recovered from the third plurality of successive units with parts of the code word recovered from the fourth plurality of successive units, and to form the dependent correlation value for the combined parts forming a sixth partial code word, the detector being operable to detect the code word if the dependent correlation value exceeds the predetermined threshold and otherwise to form iteratively the first, second, third and fourth plurality of parts of the recovered code word, and to determine whether the dependent correlation value exceeds the threshold.

Claim 6 (Cancelled).

Claim 7 (Currently Amended): A data processing apparatus as claimed in Claim 1, wherein the detector and the correlator are operable in combination to form the dependent correlation value for at least one selected code word re-generated from ~~the~~ a set of code words that are stored, the code word being selected from the set in accordance with the relative magnitudes of the dependent correlation value formed for each code word of the set.

Claim 8 (Currently Amended): A data processing apparatus as claimed in Claim 1, wherein the ~~plurality of whole code words are~~ word is part of a set of code words that are formed from a first code word having a plurality of predetermined pseudo-randomly distributed coefficients and by generating other code words of the set by cyclically shifting the first code word, and the correlation value is formed for a plurality of the code words by

forming a Fourier transform of the recovered partial code word,

forming a Fourier transform of the first code word of the set,

forming the complex conjugate of one of the Fourier transform of the recovered partial code word and the Fourier transform of the regenerated code word,

forming intermediate product samples by multiplying each of the Fourier transform samples of the recovered partial code word and the corresponding Fourier transform samples of the first code word,

forming correlation samples by forming an inverse transform of the intermediate product samples, each of the correlation value samples providing the correlation value for one of the set of code words, wherein the forming a Fourier transform of the part of the recovered partial code word comprises setting the remaining part of the recovered code word to zero, and forming the Fourier transform of the recovered code word, and

the forming a Fourier transform of the first code word of the set comprises setting the remaining part of the first code word to zero, and forming the Fourier transform of the first code word.

Claim 9 (Currently Amended): A data processing apparatus as claimed in Claim 1, wherein the code word has been introduced into the material item in the discrete cosine transform domain, the apparatus further comprising:

a discrete cosine transform processor operable to transform the marked material item and the original material item into the discrete cosine transform domain, wherein the recovery processor is operable to generate the recovered partial code word by subtracting corresponding discrete cosine transform coefficients of the original material version from discrete cosine transform coefficients of the marked material version.

Claim 10 (Currently Amended): A data processing apparatus as claimed in Claim 1, wherein the material is video material, the plurality of material units being video images.

Claim 11 (Currently Amended): A method of identifying ~~one of a plurality of code words, forming a code word set,~~ a code word present in a marked material item, the marked material item composed of a plurality of units and the code word composed of a plurality of parts, each part including different data from the code word, the marked version having been formed by combining each of ~~a the~~ the plurality of parts of ~~a the~~ the code word with one of ~~a the~~ the plurality of units ~~from which the material item is comprised,~~ the method comprising:

recovering a partial code word composed by at least one of the plurality of parts ~~part~~ of the code word from at least one of the plurality of ~~a~~ corresponding ~~plurality of~~ units of the marked material item, ~~and~~

generating for the marked material unit item a dependent correlation value by correlating the ~~part of the partial~~ code word recovered from the material unit with a corresponding ~~part of at least one of a re-generated partial stored code words from the code word set that is a part of a whole stored code word,~~ and

determining whether ~~at least one of the code words~~ the whole code word is present in the marked material item ~~from based on~~ the dependent correlation value for the part of the partial code word exceeding a predetermined threshold, and

when the dependent correlation value does not exceed the predetermined threshold, iteratively increasing a number of ~~code word parts~~ of the code word used, to increase information quantity of the recovered partial code word to form the recovered part of the code word, each code word part taken from successive material units, and

~~each time the number of code word parts used to form the recovered part of the~~ information quantity of the partial code word is iteratively increased, generating a dependent correlation value by correlating the ~~recovered part of the partial~~ code word having increased information quantity with the a corresponding parts of the re-generated partial stored code word, the iterative increasing of the ~~recovered part information quantity of the partial~~ code word continuing until the whole code word is recovered by said step of recovering, and correlated with the whole re-generated stored code word by said step of generating, or the predetermined threshold exceeded.

Claim 12 (Currently Amended): A method of identifying as claimed in Claim 11, wherein the generating a dependent correlation value comprises

forming a dependent correlation ~~value values~~ for each of a plurality of parts of the recovered partial code word words in parallel, and if some of the correlation value values exceed exceeds the predetermined threshold for one of the dependent correlation values,

identifying the code word as ~~present~~ according to a predetermined false detection probability.

Claim 13 (Currently Amended): A method of identifying as claimed in Claim 12, wherein the generating a dependent correlation value includes forming the dependent correlation values by combining the plurality of parts of the code word recovered from

successive material units to form a partial code word, and by correlating the parts formed from successive units with corresponding part of the regenerated code word.

Claim 14 (Currently Amended): A method of identifying as claimed in Claim 13, wherein the generating a dependent correlation value includes forming the dependent correlation values by combining the plurality of parts of the code word recovered from a first plurality of successive material units with a plurality of parts of the code word recovered from second plurality of successive units to generate first and second partial code words, and correlating the ~~combined parts~~ first and second partial code words with corresponding parts of the ~~re-generated~~ partial stored code word.

Claim 15 (Currently Amended): A method of identifying as claimed in Claim 11, wherein the generating a dependent correlation value includes

combining the parts of the code word recovered from a first plurality of successive units,

forming the dependent correlation value for the combined parts forming a first partial code word, and detecting the whole code word if the dependent correlation value exceeds the predetermined threshold and otherwise

combining the parts of the code word recovered from a second plurality of successive units, the number of units corresponding to the first plurality,

forming the dependent correlation value for the combined parts forming a second partial code word, and detecting the whole code word if the dependent correlation value exceeds the predetermined threshold and otherwise

combining the parts of the code word recovered from the first plurality of successive units with parts of the code word recovered from the second plurality of successive units,

forming the dependent correlation value for the combined parts forming a third partial code word, and detecting the whole code word if the dependent correlation value exceeds the predetermined threshold and otherwise

combining the parts of the code word recovered from a third plurality of successive units,

forming the dependent correlation value for the combined parts forming a fourth partial code word, and detecting the whole code word if the dependent correlation value exceeds the predetermined threshold and otherwise

combining the parts of the code word recovered from a fourth plurality of successive units, the number of units corresponding to the third plurality,

forming the dependent correlation value for the combined parts forming a fifth partial code word, and detecting the whole code word if the dependent correlation value exceeds the predetermined threshold and otherwise

combining the parts of the code word recovered from the third plurality of successive units with parts of the code word recovered from the fourth plurality of successive units,

forming the dependent correlation value for the combined parts forming a sixth partial code word, and detecting the whole code word if the dependent correlation value exceeds the predetermined threshold and otherwise

forming iteratively the first, second, third and fourth plurality of parts of the recovered code word, and

determining whether the dependent correlation value exceeds the threshold.

Claim 16 (Cancelled).

Claim 17 (Currently Amended): An encoding data processing apparatus ~~operable to form a marked version of a material item by combining each version of a material item with one or more of a plurality of code words from a code word set, each of a plurality of parts of the code word including a plurality of code word coefficients being combined with one of a plurality of units from which the material item is comprised by adding each coefficient of the code word part to an element of the material item unit so that each of the plurality of units has one of the code word parts combined therewith, wherein successive parts of the code word are combined respectively with successive units of the material item with the effect that the one or more code words in the material item sequence can be identified by a detecting data processing apparatus, the detecting data processing apparatus comprising:~~

a recovery processor operable to recover a partial code word that is composed by at least one part of the a whole code word, each part including different data from the code word, the partial code word recovered from a corresponding unit of the a marked material item, and the marked material item composed of a plurality of units, the marked version formed by combining each part of the code word with one of the plurality of units,

a correlator operable to generate for the marked material ~~unit-item~~ a dependent correlation value by correlating the ~~part of the partial~~ code word recovered from the material unit with a corresponding part of at least one of a re-generated code words from the code word set partial stored code word that is a part of a whole stored code word, and

a detector operable to determine whether ~~at least one of the code words~~ the whole stored code word is present in the marked material item ~~from based on~~ the dependent correlation value for the ~~part of the partial~~ code word exceeding a predetermined threshold, wherein

when the dependent correlation value does not exceed the predetermined threshold, the correlator is operable ~~under control of the detector~~ to iteratively increase a number of

~~code word parts of the code word used, to increase information quantity of the recovered partial code word to form the recovered part of the code word, each code word part taken from successive material units,~~

each time the ~~number of code word parts used to form the recovered part information~~ quantity of the partial code word is ~~iteratively~~ increased, the correlator is operable to generate a dependent correlation value by correlating the ~~recovered part of the partial~~ code word that having increased information quantity with a corresponding parts of the re-generated partial stored code word, the iterative increasing of the ~~recovered part information quantity~~ of the partial code word continuing until the whole code word is recovered by the recovery processor, and correlated with the whole ~~re-generated stored~~ code word by the correlator, or the predetermined threshold exceeded.

Claim 18 (Currently Amended): An encoding data processing apparatus as claimed in Claim 17, wherein the ~~plurality of code word is chosen from a plurality of code words that~~ are formed from a first code word having a plurality of predetermined pseudo-randomly distributed coefficients and by generating other code words of the set by cyclically shifting the first code word.

Claims 19-20 (Cancelled).

Claim 21 (Currently Amended): A system for identifying versions of a material item, the system comprising:

an encoding data processing apparatus operable to form marked versions of the material item by combining each version with ~~at least one of a plurality of code words from a code word set~~ a code word having a plurality of parts, each part including different data from

the code word, the material item composed of a plurality of units. each of ~~the a~~ plurality of parts of the code word being combined with one of ~~a~~ the plurality of units ~~from which the version of the material item is comprised,~~ and

a detecting data processing apparatus operable to identify ~~at least one of the plurality of code words~~ the code word present in a marked version of the material item, the detecting data processing apparatus comprising

a recovery processor operable to recover a partial code word composed by at least one of the plurality of ~~part~~ parts of a code word from at least one of the plurality of a corresponding ~~unit~~ units of the marked material item, and

a correlator operable to generate for the marked material ~~unit~~ item a dependent correlation value by correlating the ~~part of the partial~~ code word recovered from the material unit with a corresponding ~~part of at least one of a re-generated code word from the partial~~ stored code word-set that is a part of a whole stored code word, and

a detector operable to determine whether ~~at least one of the whole code words~~ word is present in the marked material item ~~from~~ based on the dependent correlation value for the ~~part of a partial~~ code word exceeding a predetermined threshold, wherein

when the dependent correlation value does not exceed the predetermined threshold, the correlator is operable ~~under control of the detector~~ to iteratively increase a number of ~~code word parts~~ of the code word used, to increase information quantity of the recovered partial code word ~~to form the recovered part of the code word, each code word part taken from successive material units,~~

each time the ~~number of code word parts used to form the recovered part~~ information quantity of the partial code word is ~~iteratively~~ increased, the correlator is operable to generate a dependent correlation value by correlating the ~~recovered part of the partial~~ code word having increased information quantity with a corresponding parts of the re-generated partial

stored code word, the iterative increasing of the ~~recovered part information quantity~~ of the partial code word continuing until the whole code word is recovered by the recovery processor, and correlated with the whole ~~regenerated stored~~ code word by the correlator, or the predetermined threshold exceeded.

Claim 22 (Currently Amended): A computer-readable medium having a computer program recorded thereon, the program composed of ~~providing~~ computer executable instructions, which when loaded on to a data processor causes the data processor to perform the method according to Claim 11.

Claims 23-25 (Cancelled).

Claim 26 (Previously Presented): The data processing apparatus according to Claim 1, wherein the iterative increasing of the number of code word parts used increases the number by a factor two for each increase.

Claim 27 (Previously Presented): The method of identifying one of the plurality of code words according to Claim 11, wherein the iterative increasing of the number of code word parts used increases the number by a factor two for each increase.

Claim 28 (Previously Presented): The encoding data processing apparatus according to Claim 17, wherein the iterative increasing of the number of code word parts used increases the number by a factor two for each increase.

Claim 29 (Previously Presented): The system for identifying versions of the material item according to Claim 21, wherein the iterative increasing of the number of code word parts used increases the number by a factor two for each increase.